Report No. IITRI-L6021-11
(Quarterly Progress Report)

DEVELOPMENT OF AN ORALLY EFFECTIVE INSECT REPELLENT

Headquarters
U.S. Army Medical Research
and Development Command
Office of the Surgeon General
Washington, D.C.

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IITRI Project L6021
Contract No. DA-49-193-MD-2281

May 1 through July 31, 1967

I. INTRODUCTION

During this report period, we completed fabrication of two additional bitometers and are now completing the final calibration of these instruments.

We developed a new computer program that essentially incorporates all the desirable features of the old program. In addition, the new program gives a continuous estimate of how the repellency of test compounds differs from that of controls. Thus the data are handled much more efficiently.

We also continued work with the crayfish intestine preparation in efforts to test the GABA* hypothesis in a physiological system.

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*Gamma-aminobutyric acid.

II. THE NEW BITOMETERS

We have constructed a total of three bitometers.[1,2] These instruments are in the final stages of calibration, and preliminary tests have shown that they are sufficiently sensitive to respond to the biting of even a single mosquito and that they operate satisfactorily in our assay system. We anticipate that these meters will considerably simplify and expedite the experimental work.

III. THE NEW COMPUTER PROGRAM

In previous reports the computer printout for the repellency test data gave confidence limits in terms of differences from control values. As a result, we could state with a given level of assurance, reflected in the 95% confidence limit, whether a given compound significantly decreased the mosquito biting of a treated mouse over that of an untreated control. We had no means, however, of estimating how different from control values the tests were.

In order to estimate this difference, we modified the computer program,[1,2] so that the control values could be multiplied by any fraction, i.e., 0.9 or 0.75, etc., to ascertain the point at which repellency did not differ significantly from the fractional value of controls at the 95% confidence level.

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[1]Kashin, P., "Development of an Orally Effective Insect Repellent," Report No. IITRI-L6021-9 (Quarterly Progress Report), Contract No. DA-49-193-MD-2281 conducted by IIT Research Institute, Chicago, Illinois, January 31, 1967.

[2]Kashin, P., "Development of an Orally Effective Insect Repellent," Report No. IITRI-L6021-10 (Quarterly Progress Report), Contract No. DA-49-193-MD-2281 conducted by IIT Research Institute, Chicago, Illinois, April 30, 1967.

Thus the compounds could be ranked according to their repellency at given treatment levels, even when two compounds are repellent at the 95% level of confidence. In other words, we can state that one compound reduces biting more than another, even though both are significantly repellent.

This method of handling the data, however, became cumbersome. The fractions chosen for multiplying the control values were discrete, and a continuous comparison in terms of differences from controls could not be obtained. This method was also expensive in terms of computer time, since the data had to be computed separately for each fraction of the control values.

Thus a new computer program was developed that gives a continuous ranking of compounds in terms of control values. It is now possible to determine at a glance the effectiveness of a repellent, i.e., how much biting is decreased when compared to the optimally weighted controls.[3] For clarity, we have recomputed the data that we submitted in the last report[2] with the new program. The appendix shows these data. Further assays that were subsequently performed on these same compounds are also included in this data. Further testing needs to be done with some of these compounds and the lower limits of repellency for compounds whose limit has not yet been reached should be established.

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[3]Kashin, P., "Development of an Orally Effective Insect Repellent," Report No. IITRI-L6021-8 (Annual Report), Contract No. DA-49-193-MD-2281 conducted by IIT Research Institute, Chicago, Illinois, October 31, 1966.

It should be mentioned that the "conditioning" procedure described in the last report,[2] i.e., placing a bronze mesh on the mosquito container 24 hr before the test, is no longer being done. A statistical discriminant function analysis of the controls has shown that this procedure does not significantly improve or in any way change the results of the tests.

The major change in the computer printout can be seen in the column that was formerly labeled "confidence level (PCT);" this column now reads "weighted percent of controls." Two numbers for each test compound are entered in this column. The first, unlabeled number is the percentage of decrease in biting from the controls for a given series of tests. The second number is labeled "upper bound." This number replaces the confidence limit; any value below 100 indicates that this compound is significantly repellent at the 95% confidence limit. The magnitude of the number indicates how close to the 95% confidence limit the compound is repellent. A very low number indicates that the compound is more repellent than a high number even though both may fall within the 95% confidence limit if they are less than 100. A value of 100 or greater for the upper bound indicates that the compound is not significantly repellent when compared with parallel controls and that it does not fall within the 95% confidence limit. Comparison of the entries in this report with those in the previous report[2] illustrates these points. Thus, with the new computer program, the repellency of various compounds can be ranked according

to their differences from controls at similar levels of treatment and sound judgements of relative repellency are based upon firm statistical grounds.

IV. STATISTICAL FORMULAE

The following discussion presents the formulae used to define the percent of control and the upper limit (bound), which indicates statistical significance, and includes a brief description of the application of these indicators.

The program for the contrast analysis was modified so that the weighted mean of the repellency index is given as a percent of the control response, and statistical significance is indicated by the 95% confidence level upper bound. This level is represented by a value of 100 for this statistic. This replaces the indication of confidence level and permits a comparative ranking of compounds by their significance level. Uncertainty concerning the extremes of the distribution are ameliorated by this approach. The 95% limits are relatively stable with respect to variations from normality (i.e., a robust statistical estimate) as compared with higher levels of confidence.

In order to give a complete formulation of these statistics, it is necessary to repeat the formulation of the t-test for significant differences.[3]

The following formulae take into account the fact that the repellency index for untreated controls repeatedly shows significant day-to-day variation. This day effect is removed in the contrast

analysis, which includes an efficient statistical test of significance of variations from the mean of the control observations as follows:

Xi (C) is the mean of control observations on day i.

Xi (T) is the mean of test observations on day i.

Mi is the number of control observations on day i.

Ni is the number of test observations on day i.

Wi is the weight for the contrast for day i.

$$Wi = \frac{1}{\left(\frac{1}{Mi} + \frac{1}{Ni}\right)} \tag{1}$$

$$\overline{X(C)} = \frac{\sum_i Wi\ Xi(C)}{\sum_i Wi} \tag{2}$$

$$\overline{X(T)} = \frac{\sum_i Wi\ Xi(T)}{\sum_i Wi} \tag{3}$$

$$K(T) = \overline{X(C)} - \overline{X(T)} \tag{4}$$

where K(T) is the weighted average of the contrast for the test group.

Equation 4 is the optimum contrast weighted by the number of test and control observations on each day.

Let S^2 represent the mean square error and let f be the number of degrees of freedom for the error in the analysis of variance for the day-to-day variation in control observations. Then the variance for the weighted average for the contrast of the test group, K(T), is:

$$\text{Var } K(T) = \frac{S^2}{\sum_i Wi} \tag{5}$$

The two-tailed test of significance, allowing equal risk of variations above and below the control mean, is used at the 95% confidence limit. If,

$$\frac{K(T)}{\sqrt{\text{Var } K(T)}} > t_{.975}(f), \tag{6}$$

then the test group, T, is significantly different from the control group at the 95% confidence level.

For comparison it is convenient to represent the repellency index of the tests as a percent of the repellency index of the controls:

$$\text{Percent of controls} = \frac{\overline{X(T)}}{\overline{X(C)}}$$

The upper limit for this percent of controls is a convenient indicator of significance as well as of the level of established merit, i.e., the distance from this upper limit or ranking. This upper limit is developed by multiplying by $\sqrt{\text{Var } K(T)}$ and adding $\overline{X(T)}$ on both side of the above inequality 6:

$$\overline{X(T)} + K(T) > \overline{X(T)} + t_{.975}(f)\sqrt{\text{Var } K(T)} \tag{7}$$

The weighted average for the contrast for the test group as developed in a previous report[3] is:

$$K(T) = \overline{X(C)} - \overline{X(T)} \tag{8}$$

or the difference between the means of the control observations on day i and the test observations on day i.

Substituting in the left side of the above inequality (7) gives:

$$\overline{X(T)} + K(T) = \overline{X(C)} \tag{9}$$

and dividing by the left side gives:

$$1 > \frac{\overline{X(T)} + t_{.975}(f)\ \sqrt{\text{Var } K(T)}}{\overline{X(C)}} \tag{10}$$

Expression 10 is our test of significance. The right side of the expression is the upper bound for the percent of control repellency index. If this upper bound is equal to or greater than 1, the repellency index of the test compound is not significantly different from that of the untreated controls.

The number 1 is given in terms of percent, as previously shown, and is equivalent to 100 in the upper bound computation of the computer output.

This index is useful for indicating the level of reduction of biting that can be assured at a given point in testing. If few tests have been run, a compound that shows a low percent of control but has a high upper bound occasionally occurs.

This may seem contradictory. However, this result simply indicates that further testing may be required to establish the efficacy of the test compound.

The index automatically takes into account control variation and the number of test and control observations for all days of the test. Thus tests can be scheduled for convenience and maximum efficiency.

V. PHYSIOLOGICAL INVESTIGATIONS OF GABA-CO_2 COMPLEXES

We performed a number of experiments with the crayfish intestine preparation, described in past reports,[3] in continuation of tests of the validity of the GABA-CO_2 hypothesis in a physiological system. Various modifications of the testing procedure had to be made, and it now appears that our test system is working. We have obtained presumptive evidence that a GABA-CO_2 complex may indeed diminish GABA inhibition. The methods and data will be discussed when more experimental evidence has been accumulated.

VI. PERSONNEL AND RECORDS

The author is grateful to Mr. Clarence Boyle for his technical assistance in this work and to Mr. Merl L. Kardatzke for the development of the statistical methods and computer program used in analyzing the data. All data are recorded in Logbook C17599 and preserved in the form of keypunch cards, computer output sheets, and electronic and kymograph chart recordings.

Respectfully submitted,

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PK/cg

APPENDIX

ASSAY OF COMPOUNDS FOR REPELLENCY

The control values upon which the tests of repellency of the following compounds were based are shown in Appendix A. The abbreviated compound names and the treatments listed on the computer program are defined below.

Computer Listing	Compound Name, Formula and Treatment
AO- and YO- series	Supplied by Dr. R. P. Qaintana of the University of Tennessee.
3-NH2-1-PROPANOL	3-Amino-1-propanol $CH_2(OH)CH_2CH_2(NH_2)$
3-DEA-1-PROPANOL	3-Diethylamino-1-propanol $(C_2H_5)_2NCH_2CH_2CH_2(OH)$
1-DEA-2-PROPANOL	1-Diethylamino-2-propanol $(C_2H_5)_2NCH_2CH(OH)CH_3$
4-DEA-1-BUTANOL	4-Diethylamino-1-butanol $(C_2H_5)_2NCH_2CH_2CH_2CH_2OH$
3-DMA-1-PROPANOL	3-Dimethylamino-1-propanol $(CH_3)_2N(CH_2)_3OH$
1-DMA-2-PROPANOL	1-Dimethylamino-2-propanol $(CH_3)_2NCH_2CH(OH)CH_3$

Computer Listing	Compound Name, Formula and Treatment
4-DMA-1-BUTANOL	4-Dimethylamino-1-butanol $(CH_3)_2N(CH_2)_4OH$
1133TETRAMETHUREA	1,1,3,3-tetramethylurea $(CH_3)_2NCON(CH_3)_2$
DEA ACETONE	Diethylamino acetone $(C_2H_5)_2NCH_2COCH_3$
GABA-ETHYL-ESTER	Gamma-aminobutyrate ethyl ester $(NH_2)CH_2CH_2CH_2COOC_2H_5$
2 AMETHOXYETHANOL	2-(2-Aminoethoxy)-ethanol $H_2NCH_2CH_2OCH_2CH_2OH$
3-BUTENE-2-OL	3-Butene-2-ol $CH_3CH(OH)CH{:}CH_2$
4 AMBUTALDDEAHWNB	4-Aminobutyraldehyde diethyl acetal Hydrolyzed in water with hydrochloric acid, neutralized with base
2AM-BENZALDEHYDE	2-Aminobenzaldehyde $o\text{-}H_2N(C_6H_4)CHO$
NNDIETMETCLBENZAM*	N,N-Diethylmetachlorobenzamide $m\text{-}(C_2H_5)_2NCO(C_6H_4)Cl$
4DEAETHOXY BENZAD	4-[β-(Diethylamino)-ethoxy]-benzaldehyde $(C_2H_5)_2NCH_2CH_2OC_6H_4CHO$

* Submitted for testing by Johnson's Wax Corporation, Racine, Wisconsin.

Computer Listing	Compound Name, Formula and Treatment
NNDIPENYLFORMIDE	N,N-Diphenylformamide $HCON(C_6H_5)_2$
DEAACETALD DEACET	Diethylaminoacetaldehyde diethyl acetal $(C_2H_5)_2NCH_2CH<^{O(C_2H_5)}_{O(C_2H_5)}$

CONTROL VALUES

COMPOUND NAME	CONCENTRATION ON FORCE (MG/5 SQ CM)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS	Day of Test	Test Number
	-0.00000	5.77	63.00	68.77		22	1
	-0.00000	5.77	45.72	51.49		22	2
	-0.00000	3.85	22.66	26.51		22	3
	-0.00000	47.17	83.50	130.67		22	4
	-0.00000	18.00	61.76	79.76		23	5
	-0.00000	7.69	49.20	56.89		23	6
	-0.00000	6.16	43.56	51.72		23	7
	-0.00000	8.00	57.58	65.58		23	8
	-0.00000	11.76	52.98	64.75		24	9
	-0.00000	5.88	44.76	50.64		24	10
	-0.00000	12.24	42.38	54.62		24	11
	-0.00000	8.33	65.39	73.72		25	12
	-0.00000	3.77	53.39	57.16		25	13
	-0.00000	52.08	95.84	147.93		25	14
	-0.00000	52.27	98.94	151.21		26	15
	-0.00000	17.65	67.48	85.13		26	16
	-0.00000	62.00	94.86	156.86		27	17
	-0.00000	31.25	91.54	122.79		27	18
	-0.00000	28.26	95.71	123.97		28	19
	-0.00000	52.50	93.09	145.59		28	20
	-0.00000	36.00	63.43	99.43		28	21
	-0.00000	9.09	52.54	61.63		29	22
	-0.00000	10.20	56.13	66.34		30	23
	-0.00000	30.23	88.76	118.99		30	24
	-0.00000	19.61	67.99	87.60		31	25
	-0.00000	11.76	62.38	74.15		31	26
	-0.00000	15.38	91.99	107.37		32	27
	-0.00000	6.00	55.05	61.05		32	28
	-0.00000	7.84	52.81	60.65		33	29
	-0.00000	61.11	92.40	153.52		33	30
	-0.00000	23.53	97.13	120.66		34	31
	-0.00000	42.00	90.35	132.35		34	32
	-0.00000	6.38	38.18	44.56		34	33
	-0.00000	20.75	73.80	94.56		34	34
	-0.00000	14.89	63.17	78.07		35	35
	-0.00000	30.00	59.66	89.66		35	36
	-0.00000	10.20	53.78	63.98		36	37
	-0.00000	22.00	66.08	88.08		36	38
	-0.00000	36.73	84.75	121.48		37	39
	-0.00000	24.49	69.11	93.60		37	40
	-0.00000	22.44	95.98	118.43		37	41
	-0.00000	16.67	78.62	95.29		37	42
	-0.00000	16.98	92.73	109.71		38	43
	-0.00000	10.00	74.15	84.15		38	44

CONTROL VALUES (Cont.)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGAGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS	Day of Test	Test Number
	-0.00000	7.27	65.56	72.83		39	45
	-0.00000	9.62	77.18	86.80		39	46
	-0.00000	14.81	67.02	81.83		40	47
	-0.00000	28.30	85.08	113.38		40	48
	-0.00000	46.15	98.31	144.46		41	49
	-0.00000	37.04	97.45	134.48		42	50
	-0.00000	46.06	95.48	141.48		42	51
	-0.00000	5.66	39.05	44.71		43	52
	-0.00000	65.38	98.40	163.78		44	53
	-0.00000	70.91	87.01	157.92		44	54
	-0.00000	26.42	85.30	111.71		45	55
	-0.00000	36.00	68.82	104.82		45	56
	-0.00000	42.31	97.07	139.38		45	57
	-0.00000	10.00	66.43	76.48		46	58
	-0.00000	32.65	84.65	117.30		46	59
	-0.00000	56.86	98.95	155.81		47	60
	-0.00000	66.67	74.86	141.53		47	61
	-0.00000	40.00	85.14	125.14		47	62
	-0.00000	32.65	96.27	128.92		47	63
	-0.00000	29.17	78.13	107.30		47	64
	-0.00000	33.33	78.55	111.89		47	65
	-0.00000	33.33	86.78	120.11		48	66
	-0.00000	27.45	84.09	111.54		48	67
	-0.00000	16.67	48.73	65.40		49	68
	-0.00000	16.00	74.74	90.74		49	69
	-0.00000	35.29	79.94	115.24		49	70
	-0.00000	14.00	58.90	72.90		49	71
	-0.00000	30.00	94.17	124.17		49	72
	-0.00000	46.15	84.19	130.34		50	73
	-0.00000	16.98	73.20	90.19		50	74
	-0.00000	3.70	14.81	18.51		50	75
	-0.00000	4.00	22.65	26.65		50	76
	-0.00000	3.85	48.56	52.40		51	77
	-0.00000	9.09	60.56	69.66		51	78
	-0.00000	21.57	57.84	79.41		52	79
	-0.00000	8.00	51.81	59.81		52	80
	-0.00000	7.55	33.30	40.84		52	81
	-0.00000	17.31	60.09	77.40		53	82
	-0.00000	26.92	69.27	96.20		53	83
	-0.00000	4.26	38.56	42.84		54	84
	-0.00000	5.77	38.67	44.43		54	85
	-0.00000	20.41	77.38	97.79		55	86
	-0.00000	26.42	93.45	119.87		55	87
	-0.00000	14.81	75.80	90.61		56	88

CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.IN.(M)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
	-0.00000	28.85	77.85	106.70			56	89
	-0.00000	17.65	79.83	97.48			57	90
	-0.00000	16.33	63.31	79.63			57	91
	-0.00000	7.41	60.99	68.39			57	92
	-0.00000	12.00	50.66	62.66			58	93
	-0.00000	30.19	99.46	129.64			58	94
	-0.00000	20.75	78.17	96.93			59	95
	-0.00000	24.53	89.38	113.90			59	96
	-0.00000	12.96	50.11	63.07			60	97
	-0.00000	27.78	49.72	77.50			60	98
	-0.00000	14.00	71.19	85.19			61	99
	-0.00000	22.64	83.31	105.96			61	100
	-0.00000	13.46	59.72	73.19			62	101
	-0.00000	7.69	37.62	45.31			62	102
	-0.00000	7.27	64.88	72.15			63	103
	-0.00000	19.61	55.37	74.98			63	104
	-0.00000	25.45	81.82	107.28			64	105
	-0.00000	35.19	83.09	118.28			64	106
	-0.00000	24.44	81.16	105.60			65	107
	-0.00000	22.64	82.49	105.13			65	108
	-0.00000	19.61	42.22	61.82			1	109
	-0.00000	7.55	85.51	93.06			1	110
	-0.00000	36.54	80.44	116.98			2	111
	-0.00000	22.45	51.10	73.55			2	112
	-0.00000	10.20	56.24	66.45			3	113
	-0.00000	30.00	73.72	103.72			3	114
	-0.00000	11.54	60.39	71.92			3	115
	-0.00000	7.41	52.84	60.24			4	116
	-0.00000	18.87	67.73	86.60			4	117
	-0.00000	5.77	25.08	30.85			5	118
	-0.00000	14.81	72.87	87.69			5	119
	-0.00000	9.26	56.30	65.56			5	120
	-0.00000	38.90	72.13	110.13			6	121
	-0.00000	26.42	84.21	110.63			7	122
CONTROL	-0.00000	22.48	69.49	91.97	100.0	-0.0000=CONTRAST		
		15.52	19.53	32.45	(107.5)UPPER BOUND	3.4632=STANDARD ERROR		

ANALYSIS OF VARIANCE OF CONTROLS

EFFECT	S.S.	D.F.	M.S.	F
DAY	75496.391	50.	1509.928	2.064
ERROR	51945.969	71.	731.633	
TOTAL	127442.359	121.	1053.243	

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
A036								
	50.00000	0.00	0.00	0.00				
	50.00000	0.00	3.21	3.21			34	1
							34	2
A036	50.00000	0.00	1.60	1.60	1.6			
		-0.00	2.27	2.27	(49.3)UPPER BOUND	96.4796=CONTRAST 23.4249=STANDARD ERROR		
A036								
	30.00000	6.38	17.60	23.98				
	30.00000	5.77	70.68	76.45			33	1
							33	2
A036	30.00000	6.08	44.14	50.21	46.9			
		0.43	37.54	37.10	(97.3)UPPER BOUND	56.8694=CONTRAST 27.0487=STANDARD ERROR		
A036								
	10.00000	4.00	19.44	23.44				
	10.00000	10.20	63.00	73.20			33	1
							33	2
A036	10.00000	7.10	41.22	48.32	49.1			
		4.39	30.80	35.19	(95.5)UPPER BOUND	58.7636=CONTRAST 27.0487=STANDARD ERROR		
A036								
	5.00000	2.13	15.55	17.68				
	5.00000	7.55	49.04	56.59			34	1
							34	2
A036	5.00000	4.84	32.30	37.13	37.9			
		3.83	23.68	27.51	(85.5)UPPER BOUND	60.8984=CONTRAST 23.4249=STANDARD ERROR		
A035								
	30.00000	0.00	0.00	0.00				
	30.00000	0.00	0.00	0.00			32	1
							32	2
A035	30.00000	0.00	0.00	0.00	0.0			
		-0.00	-0.00	-0.00	(64.1)UPPER BOUND	84.2143=CONTRAST 27.0487=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/50.5SQCM)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
A035	10.00000	7.55	48.06	55.61			32	1
	10.00000	0.00	0.00	0.00			32	2
A035	10.00000	3.77	24.03	27.80	33.6	56.4097=CONTRAST		
		5.34	33.98	39.32	(97.1)UPPER BOUND	27.0487=STANDARD ERROR		
A035	5.00000	16.98	81.08	98.06			34	1
	5.00000	3.92	33.92	37.84			34	2
A035	5.00000	10.45	57.50	67.95	69.3	39.0808=CONTRAST		
		9.23	33.35	42.58	(117.0)UPPER BOUND	23.4249=STANDARD ERROR		
A032	75.00000	0.00	26.83	26.83			28	1
A032	75.00000	0.00	26.83	26.83	21.8	96.1627=CONTRAST		
		-0.00	-0.00	-0.00	(72.5)UPPER BOUND	31.2332=STANDARD ERROR		
A032	50.00000	0.00	0.00	0.00			28	1
A032	50.00000	0.00	0.00	0.00	0.0	122.9960=CONTRAST		
		-0.00	-0.00	-0.00	(50.7)UPPER BOUND	31.2332=STANDARD ERROR		
A032	25.00000	0.00	0.00	0.00			28	1
A032	25.00000	0.00	0.00	0.00	0.0	122.9960=CONTRAST		
		-0.00	-0.00	-0.00	(50.7)UPPER BOUND	31.2332=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/50.8HCM)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
A0032								
	10.00000	15.69	68.05	83.74				
	10.00000	1.85	34.56	36.42			29	1
							34	2
A0032	10.00000	8.77	51.31	60.08	65.0			
		9.76	23.64	33.46	(121.3)UPPER BOUND	39.4143=CONTRAST 23.7233=STANDARD ERROR		
A0033								
	50.00000	0.00	0.00	0.00				
A0033	50.00000	0.00	0.00	0.00	0.0		31	1
		-0.00	-0.00	-0.00	(81.7)UPPER BOUND	80.8720=CONTRAST 33.1276=STANDARD ERROR		
A0033								
	30.00000	0.00	13.66	13.66				
A0033	30.00000	0.00	13.66	13.66	16.9		31	1
		-0.00	-0.00	-0.00	(98.6)UPPER BOUND	67.2084=CONTRAST 33.1278=STANDARD ERROR		
A0033								
	10.00000	2.27	16.58	18.86				
	10.00000	22.45	70.23	92.68			30	1
							30	2
A0033	10.00000	12.36	43.41	55.77	60.6			
		14.27	37.93	52.20	(118.4)UPPER BOUND	6972=CONTRAST .0487=STANDARD ERROR		
A0034								
	50.00000	0.00	5.76	5.76				
	50.00000	1.92	13.90	15.82			40	1
							40	2
A0034	50.00000	0.96	9.83	10.79	11.1			
		1.36	5.75	7.11	(66.3)UPPER BOUND	86.8136=CONTRAST 27.0487=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (mg/SQ.IN.(M)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
AC29								
	30.00000	0.00	0.00	0.00			-0	1
	30.00000	0.00	3.77	3.77			-0	2
AC29	30.00000	0.00	1.88	1.88	1.9	95.7219=CONTRAST		
		-0.00	2.67	2.67	(57.2)UPPER BOUND	27.0487=STANDARD ERROR		
AC2F								
	50.00000	0.00	0.00	0.00				
	50.00000	0.00	0.00	0.00			39	1
							39	2
AC2b	50.00000	0.00	0.00	0.00	0.0	79.8145=CONTRAST		
		-0.00	-0.00	-0.00	(67.6)UPPER BOUND	27.0487=STANDARD ERROR		
AC2a								
	30.00000	3.77	31.61	35.39				
	30.00000	3.64	16.63	20.27			39	1
							39	2
AC2E	30.00000	3.70	24.12	27.83	34.9	51.9876=CONTRAST		
		0.10	10.68	10.69	(102.5)UPPER BOUND	27.0487=STANDARD ERROR		
AC2c								
	10.00000	7.27	51.71	58.99				
	10.00000	17.65	59.22	76.87			6	1
							7	2
AC28	10.00000	12.46	55.47	67.93	61.5	42.4509=CONTRAST		
		7.34	5.31	12.65	(110.4)UPPER BOUND	27.0487=STANDARD ERROR		
AC2d								
	5.00000	9.26	59.63	69.09				
	5.00000	23.08	83.21	106.29			5	1
							7	2
AC2F	5.00000	16.17	71.52	87.69	79.4	22.6874=CONTRAST		
		9.77	16.53	26.30	(128.3)UPPER BOUND	27.0487=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
A010								
	50.00000	0.00	0.00	0.00				
	50.00000	0.00	0.00	0.00			38	1
							38	2
AC16	50.00000	0.00	0.00	0.00	0.0			
		-0.00	-0.00	-0.00	(55.7)UPPER BOUND	96.929=CONTRAST 27.0487=STANDARD ERROR		
A016								
	30.00000	2.00	8.18	10.18				
	30.00000	6.00	47.99	53.99			38	1
							38	2
AC16	30.00000	4.00	28.00	32.08	33.1			
		2.83	28.15	30.98	(88.6)UPPER BOUND	64.8471=CONTRAST 27.0487=STANDARD ERROR		
A016								
	50.00000	1.92	9.89	11.82				
	50.00000	9.26	42.32	51.58			41	1
							37	2
AC16	50.00000	5.59	26.11	31.70	29.9			
		5.19	22.93	28.12	(68.6)UPPER BOUND	85.2465=CONTRAST 23.7233=STANDARD ERROR		
A016								
	30.00000	4.08	34.23	38.31				
	30.00000	0.00	0.00	0.00			37	1
							37	2
AC16	30.00000	2.04	17.12	19.16	17.9			
		2.89	24.21	27.09	(61.5)UPPER BOUND	88.0442=CONTRAST 23.4249=STANDARD ERROR		
A016								
	10.00000	24.00	91.34	115.34				
	10.00000	2.08	8.37	10.46			37	1
							37	2
AC16	10.00000	13.04	49.80	62.90	58.7			
		15.50	58.67	74.16	(202.3)UPPER BOUND	44.3019=CONTRAST 23.4249=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIM DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
AC13								
	30.00000	0.00	0.00	0.00			36	1
	30.00000	0.00	0.00	0.00			36	2
AC13	30.00000	0.00	0.00	0.00	0.0	76.0296=CONTRAST		
		-0.00	-0.00	-0.00	(71.0)UPPER BOUND	27.0487=STANDARD ERROR		
AC13								
	10.00000	0.00	0.00	0.00			35	1
	10.00000	3.70	19.43	23.13			35	2
	10.00000	10.33	68.38	84.71			42	3
	10.00000	24.49	63.54	88.03			42	4
AC13	10.00000	11.13	37.84	48.97	44.1	61.9540=CONTRAST		
		11.32	33.49	44.23	(78.5)UPPER BOUND	19.1263=STANDARD ERROR		
AC13								
	5.00000	3.92	27.44	31.36			35	1
	5.00000	0.00	6.53	6.53			35	2
	5.00000	4.00	28.49	32.49			37	3
	5.00000	14.58	65.48	80.06			42	4
	5.00000	16.33	78.17	94.50			42	5
AC13	5.00000	7.77	41.22	48.99	43.0	62.6369=CONTRAST		
		7.23	29.62	36.82	(72.3)UPPER BOUND	16.1647=STANDARD ERROR		
Y006								
	1.00000	1.96	34.00	35.96			44	1
	1.00000	0.00	0.00	0.00			44	2
Y006	1.00000	0.98	17.00	17.98	11.2	142.8713=CONTRAST		
		1.39	24.04	25.43	(44.7)UPPER BOUND	27.0487=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
Y006								
	0.10000	20.00	50.86	70.86				
	0.10000	26.53	80.10	106.63			44	1
							44	2
Y006	0.10000	23.27	65.48	88.75	55.2	72.1642=CONTRAST		
		4.62	20.67	25.29	(88.7)UPPER BOUND	27.0487=STANDARD ERROR		
Y006								
	0.01000	0.00	0.00	0.00				
	0.01000	16.67	74.22	90.89			4	1
							5	2
Y006	0.01000	8.33	37.11	45.44	71.8	18.9225=CONTRAST		
		11.79	52.48	64.27	(139.4)UPPER BOUND	22.7255=STANDARD ERROR		
Y007								
	10.80000	0.00	0.00	0.00			45	1
Y007	10.80000	0.00	0.00	0.00	0.0	118.6375=CONTRAST		
		-0.00	-0.00	-0.00	(52.5)UPPER BOUND	31.2332=STANDARD ERROR		
Y007								
	1.00000	0.00	2.77	2.77				
	1.00000	2.00	18.85	20.85			45	1
							45	2
Y007	1.00000	1.00	10.81	11.81	10.0	106.8312=CONTRAST		
		1.41	11.37	12.79	(51.5)UPPER BOUND	24.6920=STANDARD ERROR		
Y007								
	0.10000	8.00	65.58	73.58				
	0.10000	42.59	97.65	140.25			45	1
							45	2
Y007	0.10000	25.30	81.61	106.91	90.1	11.7203=CONTRAST		
		24.46	22.68	47.14	(131.6)UPPER BOUND	24.6920=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUS (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS			Day of Test	Test Number
YOOF									
	1.00000	2.04	21.89	23.93				46	1
	1.00000	4.00	13.71	17.71				46	2
YOOE	1.00000	3.02	17.80	20.82	21.5		76.0729=CONTRAST		
		1.39	5.78	4.40	(77.2)	UPPER BOUND	27.0487=STANDARD ERROR		
YOOJ									
	0.10000	4.44	36.43	40.87				46	1
	0.10000	9.09	69.90	78.99				46	2
YOOB	0.10000	6.77	53.16	59.93	61.9		36.9583=CONTRAST		
		3.29	23.67	26.95	(117.5)	UPPER BOUND	27.0487=STANDARD ERROR		
3-NH2-1-PROPANOL									
	1.00000	0.00	0.00	0.00				23	1
	1.00000	0.00	0.00	0.00				23	2
3-NH2-1-PROPANOL	1.00000	0.00	0.00	0.00	0.0		63.4886=CONTRAST		
		-0.00	-0.00	-0.00	(73.6)	UPPER BOUND	23.4249=STANDARD ERROR		
3-NH2-1-PROPANOL									
	0.10000	5.88	20.44	26.32				23	1
	0.10000	1.96	16.23	18.19				23	2
3-NH2-1-PROPANOL	0.10000	3.92	18.34	22.26	35.1		41.2290=CONTRAST		
		2.77	2.98	5.75	(108.7)	UPPER BOUND	23.4249=STANDARD ERROR		
3-DEA-1-PROPANOL									
	1.00000	0.00	4.30	4.30				27	1
	1.00000	0.00	0.00	0.00				27	2
3-DEA-1-PROPANOL	1.00000	0.00	2.15	2.15	1.5		137.6743=CONTRAST		
		-0.00	3.04	3.04	(40.1)	UPPER BOUND	27.0487=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WIEGHTED PERCENT OF CONTROLS		Day of Test	Test Number
3-DEA-1-PROPANOL								
	0.10000	2.13	36.48	38.60			27	1
	0.10000	11.11	58.46	69.57			27	2
3-DEA-1-PROPANOL	0.10000	6.62	47.47	54.09	38.7	85.7395=CONTRAST		
		6.35	15.54	21.90	(77.3)UPPER BOUND	27.0487=STANDARD ERROR		
3-DEA-1-PROPANOL								
	0.01000	11.32	43.50	54.82			4	1
	0.01000	3.85	45.19	49.04			5	2
3-DEA-1-PROPANOL	0.01000	7.58	44.35	51.93	77.2	15.2801=CONTRAST		
		5.29	1.20	4.09	(144.8)UPPER BOUND	22.7255=STANDARD ERROR		
1-DEA-2-PROPANOL								
	1.00000	0.00	0.00	0.00			53	1
	1.00000	0.00	0.00	0.00			53	2
1-DEA-2-PROPANOL	1.00000	0.00	0.00	0.00	0.0	86.7964=CONTRAST		
		-0.00	-0.00	-0.00	(62.2)UPPER BOUND	27.0487=STANDARD ERROR		
1-DEA-2-PROPANOL								
	0.10000	2.00	21.67	23.67			53	1
	0.10000	5.88	31.37	37.26			53	2
1-DEA-2-PROPANOL	0.10000	3.94	26.52	30.46	35.1	56.3332=CONTRAST		
		2.75	6.86	9.61	(97.3)UPPER BOUND	27.0487=STANDARD ERROR		
1-DEA-2-PROPANOL								
	0.01000	4.44	31.36	35.80			57	1
	0.01000	8.16	46.12	54.28			57	2
1-DEA-2-PROPANOL	0.01000	6.30	38.74	45.04	55.0	36.7952=CONTRAST		
		2.63	10.44	13.07	(115.2)UPPER BOUND	24.6920=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON HORSE (MG/50.IN(M)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
1-DEA-2-PROPANOL								
	0.00100	0.00	0.00	0.00			57	1
	0.00100	8.33	48.10	56.43			57	2
1-DEA-2-PROPANOL	0.00100	4.17	24.05	28.22	34.5	53.6194=CONTRAST		
		5.89	34.01	39.90	(94.7)UPPER BOUND	24.6920=STANDARD ERROR		
4-DEA-1-BUTANOL								
	1.00000	0.00	0.00	0.00			23	1
	1.00000	0.00	0.00	0.00			23	2
4-DEA-1-BUTANOL	1.00000	0.00	0.00	0.00	0.0	63.4886=CONTRAST		
		-0.00	-0.00	-0.00	(73.6)UPPER BOUND	23.4249=STANDARD ERROR		
4-DEA-1-BUTANOL								
	0.10000	0.00	0.00	0.00			23	1
	0.10000	0.00	0.00	0.00			23	2
4-DEA-1-BUTANOL	0.10000	0.00	0.00	0.00	0.0	63.4886=CONTRAST		
		-0.00	-0.00	-0.00	(73.6)UPPER BOUND	23.4249=STANDARD ERROR		
4-DEA-1-BUTANOL								
	0.01000	0.00	0.00	0.00			24	1
	0.01000	0.00	13.90	13.90			24	2
4-DEA-1-BUTANOL	0.01000	0.00	6.95	6.95	12.3	49.7183=CONTRAST		
		-0.00	9.83	9.83	(99.2)UPPER BOUND	24.6920=STANDARD ERROR		
4-DEA-1-BUTANOL								
	0.00100	0.00	0.00	0.00			24	1
	0.00100	4.08	24.86	28.96			24	2
4-DEA-1-BUTANOL	0.00100	2.04	12.44	14.48	25.5	42.1905=CONTRAST		
		2.89	17.59	20.48	(112.5)UPPER BOUND	24.6920=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
3-DMA-1-PROPANOL								
	1.00000	11.76	59.26	71.03			56	1
	1.00000	11.11	53.44	64.55			56	2
3-DMA-1-PROPANOL	1.00000	11.44	56.35	67.79	68.7	30.8689 CONTRAST		
		0.46	4.12	4.58	(123.4)UPPER BOUND	27.0487=STANDARD ERROR		
3-DMA-1-PROPANOL								
	0.10000	14.81	78.61	93.43				
	0.10000	31.48	76.50	107.98			56	1
							56	2
3-DMA-1-PROPANOL	0.10000	23.15	77.56	100.71	102.1	-2.0514 CONTRAST		
		11.79	1.49	10.29	(156.8)UPPER BOUND	27.0487=STANDARD ERROR		
3-DMA-1-PROPANOL								
	0.01000	0.00	0.00	0.00				
	0.01000	0.00	6.67	6.67			60	1
							60	2
3-DMA-1-PROPANOL	0.01000	0.00	3.33	3.33	4.7	66.9542=CONTRAST		
		-0.00	4.71	4.71	(41.5)UPPER BOUND	27.0487=STANDARD ERROR		
3-DMA-1-PROPANOL								
	0.00100	1.92	23.61	25.53				
	0.00100	3.85	41.82	45.67			60	1
							60	2
3-DMA-1-PROPANOL	0.00100	2.88	32.72	35.60	50.7	34.6857=CONTRAST		
		1.36	12.88	14.24	(127.4)UPPER BOUND	27.0487=STANDARD ERROR		
1-DMA-2-PROPANOL								
	1.00000	7.55	65.16	72.71				
	1.00000	5.77	30.00	35.77			58	1
							59	2
1-DMA-2-PROPANOL	1.00000	6.66	47.58	54.24	56.4	41.9109=CONTRAST		
		1.26	24.87	26.12	(112.5)UPPER BOUND	27.0487=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
1-DMA-2-PROPANOL								
	0.10000	3.85	31.66	35.50			58	1
	0.10000	12.50	59.95	72.45			58	2
1-DMA-2-PROPANOL	0.10000	8.17	45.80	53.97	56.1	42.1770=CONTRAST		
		6.12	20.00	26.12	(112.3)UPPER BOUND	27.0487=STANDARD ERROR		
1-DMA-2-PROPANOL								
	0.01000	4.26	38.56	42.81			59	1
	0.01000	1.94	24.64	26.60			59	2
1-DMA-2-PROPANOL	0.01000	3.11	31.60	34.71	32.6	71.7075=CONTRAST		
		1.62	9.64	11.46	(83.3)UPPER BOUND	27.0487=STANDARD ERROR		
1-DMA-2-PROPANOL								
	0.00100	5.56	77.73	83.29			59	1
	0.00100	13.21	69.16	82.37			59	2
1-DMA-2-PROPANOL	0.00100	9.38	73.45	82.83	77.8	23.5868=CONTRAST		
		5.41	6.06	0.65	(128.5)UPPER BOUND	27.0487=STANDARD ERROR		
4-DMA-1-BUTANOL								
	1.00000	0.00	0.00	0.00			25	1
	1.00000	0.00	0.00	0.00			25	2
4-DMA-1-BUTANOL	1.00000	0.00	0.00	0.00	0.0	92.9379=CONTRAST		
		-0.00	-0.00	-0.00	(53.0)UPPER BOUND	24.6920=STANDARD ERROR		
4-DMA-1-BUTANOL								
	0.10000	0.00	0.00	0.00			25	1
	0.10000	0.00	0.00	0.00			25	2
4-DMA-1-BUTANOL	0.10000	0.00	0.00	0.00	0.0	92.9379=CONTRAST		
		-0.00	-0.00	-0.00	(53.0)UPPER BOUND	24.6920=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/50.1NCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
4-DMA-1-BUTANOL								
	0.01000	0.00	0.00	0.00			25	1
	0.01000	0.00	0.00	0.00			25	2
4-DMA-1-BUTANOL	0.01000	0.00	0.00	0.00	0.0	96.9379=CONTRAST		
		-0.00	-0.00	-0.00	(-3.0)UPPER BOUND	24.6920=STANDARD ERROR		
4-DMA-1-BUTANOL								
	0.00100	0.00	0.00	0.00			25	1
	0.00100	5.77	29.47	35.24			25	2
4-DMA-1-BUTANOL	0.00100	2.88	14.74	17.62	19.6	75.3165=CONTRAST		
		4.08	20.84	24.92	(72.6)UPPER BOUND	24.6920=STANDARD ERROR		
1133TETRAMETHUREA								
	1.00000	4.08	47.07	51.15			48	1
	1.00000	18.00	55.72	73.72			48	2
1133TETRAMETHUREA	1.00000	11.04	51.40	62.44	53.9	53.3874=CONTRAST		
		9.84	6.12	15.96	(100.5)UPPER BOUND	27.0487=STANDARD ERROR		
1133TETRAMETHUREA								
	0.10000	0.00	0.00	0.00			48	1
	0.10000	4.08	27.40	31.48			48	2
	0.10000	14.29	57.57	71.85			49	3
1133TETRAMETHUREA	0.10000	6.12	28.32	34.45	39.0	64.5142=CONTRAST		
		7.36	28.80	36.02	(76.7)UPPER BOUND	19.9768=STANDARD ERROR		
1133TETRAMETHUREA								
	0.01000	1.92	17.91	19.83			62	1
	0.01000	0.00	2.49	2.49			62	2
1133TETRAMETHUREA	0.01000	0.96	10.20	11.16	18.8	48.0902=CONTRAST		
		1.36	10.90	12.26	(109.9)UPPER BOUND	27.0487=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY Index	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
1133TETRAMETHUREA								
	0.00100	0.00	4.25	4.25			62	1
	0.00100	0.00	9.25	9.25			62	2
1133TETRAMETHUREA	0.00100	0.00	6.75	6.75	11.4	52.4949=CONTRAST		
		-0.00	3.53	3.53	(192.5)UPPER BOUND	27.0487=STANDARD ERROR		
DFA ACETONE								
	1.00000	14.29	66.93	81.21			49	1
	1.00000	10.00	45.91	55.91			49	2
DFA ACETONE	1.00000	12.14	56.42	68.56	73.2	25.1254=CONTRAST		
		3.03	14.86	17.89	(121.4)UPPER BOUND	22.6306=STANDARD ERROR		
DFA ACETONE								
	0.10000	12.50	69.94	82.44			49	1
	0.10000	4.65	44.48	49.13			49	2
DFA ACETONE	0.10000	8.58	57.21	65.79	70.7	27.9011=CONTRAST		
		5.55	18.01	23.56	(118.4)UPPER BOUND	22.6306=STANDARD ERROR		
GABA-ETHYL-ESTER								
	10.00000	11.11	67.51	78.62			47	1
	10.00000	4.08	22.95	27.04			47	2
GABA-ETHYL-ESTER	10.00000	7.60	45.23	52.83	41.1	75.6006=CONTRAST		
		4.97	31.51	36.48	(75.4)UPPER BOUND	22.0852=STANDARD ERROR		
GABA-ETHYL-ESTER								
	1.00000	20.00	72.31	92.31			47	1
	1.00000	3.85	36.19	40.03			47	2
GABA-ETHYL-ESTER	1.00000	11.92	54.25	66.17	51.5	62.2614=CONTRAST		
		11.42	25.54	36.96	(85.8)UPPER BOUND	22.0852=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
2-2-METHOXYETHANOL								
	1.00000	0.00	0.00	0.00			65	1
	1.00000	16.98	44.74	61.72			65	2
2-2METHOXYETHANOL	1.00000	8.49	22.37	30.86	29.5	74.5049=CONTRAST		
		12.01	31.63	43.64	(80.5)UPPER BOUND	27.0487=STANDARD ERROR		
2-2METHOXYETHANOL								
	0.10000	20.00	62.20	82.20			65	1
	0.10000	17.31	37.40	54.71			65	2
2-2METHOXYETHANOL	0.10000	18.65	49.80	68.46	65.6	36.9072=CONTRAST		
		1.90	17.54	19.44	(116.2)UPPER BOUND	27.0487=STANDARD ERROR		
3-BUTENE-2-OL								
	0.01000	5.66	24.72	30.38			55	1
	0.01000	10.00	55.67	65.67			55	2
3-BUTENE-2-OL	0.01000	7.83	40.20	48.03	44.1	60.8017=CONTRAST		
		3.07	21.89	24.95	(93.7)UPPER BOUND	27.0487=STANDARD ERROR		
3-BUTENE-2-OL								
	0.00100	20.00	76.97	96.97			55	1
	0.00100	6.38	35.02	41.41			55	2
3-BUTENE-2-OL	0.00100	13.19	56.00	69.19	63.6	39.6433=CONTRAST		
		9.63	29.66	39.29	(113.2)UPPER BOUND	27.0487=STANDARD ERROR		
4AMBUTALDOL Amwhs								
	1.00000	0.00	0.00	0.00			24	1
	1.00000	0.00	0.00	0.00			24	2
4AMBUTALDOLAMINE	1.00000	0.00	0.00	0.00	0.0	56.6690=CONTRAST		
		-0.00	-0.00	-0.00	(86.9)UPPER BOUND	24.6920=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.CM)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY TIME	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
4AMBUTALDOL ANAND								
	0.10000	0.00	0.00	0.00			24	1
	0.10000	0.00	0.00	0.00			24	2
	0.10000	0.00	26.12	26.12			50	3
	0.10000	8.00	33.70	41.70			50	4
4AMBUTALDOL ANAND	0.10000	2.00	14.95	16.95	28.9	43.9818=CONTRAST		
		4.00	17.54	20.59	(83.7)UPPER BOUND	16.9942=STANDARD ERROR		
4AMBUTALDOL ANAND								
	0.01000	14.00	61.16	75.16			26	1
	0.01000	1.96	5.96	7.92			26	2
	0.01000	5.56	35.75	41.30			50	3
	0.01000	0.00	15.97	15.97			50	4
4AMBUTALDOL ANAND	0.01000	5.38	29.71	35.09	38.5	54.4627=CONTRAST		
		6.19	24.35	30.27	(78.4)UPPER BOUND	17.7075=STANDARD ERROR		
4AMBUTALDOL ANAND								
	0.00100	6.52	53.35	59.87			28	1
	0.00100	4.00	25.00	29.00			26	2
4AMBUTALDOL ANAND	0.00100	5.26	39.18	44.44	37.6	73.7339=CONTRAST		
		1.78	20.05	21.83	(83.3)UPPER BOUND	27.0487=STANDARD ERROR		
4AMBUTALDOL ANAND								
	0.00010	11.11	55.17	66.28			4	1
	0.00010	9.43	55.75	65.18			5	2
4AMBUTALDOL ANAND	0.00010	10.27	55.46	65.73	96.0	1.3437=CONTRAST		
		1.19	0.41	0.78	(165.6)UPPER BOUND	22.7255=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
2AM-BENZALDEHYDE								
	1.00000	0.00	0.00	0.00			50	1
	1.00000	0.00	0.00	0.00			50	2
	1.00000	0.00	0.00	0.00			52	3
	1.00000	0.00	0.00	0.00			52	4
2AM-BENZALDEHYDE	1.00000	0.00	0.00	0.00	0.0	63.4157=CONTRAST		
		-0.00	-0.00	-0.00	(53.5)UPPER BOUND	16.9962=STANDARD ERROR		
2AM-BENZALDEHYDE								
	0.10000	0.00	0.00	0.00			50	1
	0.10000	0.00	0.00	0.00			50	2
	0.10000	0.00	0.00	0.00			52	3
	0.10000	0.00	0.00	0.00			52	4
2AM-BENZALDEHYDE	0.10000	0.00	0.00	0.00	0.0	63.4157=CONTRAST		
		-0.00	-0.00	-0.00	(53.5)UPPER BOUND	16.9962=STANDARD ERROR		
2AM-BENZALDEHYDE								
	0.01000	0.00	0.00	0.00			51	1
	0.01000	0.00	0.00	0.00			51	2
	0.01000	0.00	2.40	2.40			52	3
	0.01000	0.00	0.00	0.00			52	4
2AM-BENZALDEHYDE	0.01000	0.00	0.00	0.00	0.1	59.8258=CONTRAST		
		-0.00	1.20	1.20	(61.2)UPPER BOUND	18.2362=STANDARD ERROR		
2AM-BENZALDEHYDE								
	0.00100	0.00	0.00	0.00			51	1
	0.00100	3.77	50.00	53.77			51	2
	0.00100	3.85	51.25	55.10			52	3
	0.00100	1.89	19.36	21.25			52	4
	0.00100	2.04	17.95	19.99			61	5
	0.00100	0.00	0.00	0.00			61	6
	0.00100	5.77	27.76	33.53			1	7
	0.00100	5.66	25.23	30.89			1	8
2AM-BENZALDEHYDE	0.00100	2.87	23.94	26.82	37.5	45.5167=CONTRAST		
		2.27	19.44	21.06	(73.7)UPPER BOUND	33.1984=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
2AM-BENZALDEHYDE								
	0.00010	4.26	13.41	17.67			54	1
	0.00010	6.25	16.96	23.21			54	2
	0.00010	16.38	78.78	95.06			61	3
	0.00010	0.00	0.00	0.00			61	4
	0.00010	38.89	68.54	107.43			1	5
	0.00010	5.56	34.71	40.27			1	6
2AM-BENZALDEHYDE	0.00010	11.87	35.40	47.27	65.5	24.9430=CONTRAST		
		14.26	31.80	43.91	(108.6)UPPER BOUND	15.6166=STANDARD ERROR		
2AM-BENZALDEHYDE								
	0.00001	6.00	17.79	23.79				
	0.00001	4.17	24.94	29.11			54	1
							54	2
2AM-BENZALDEHYDE	0.00001	5.08	21.37	26.45	60.6	17.1847=CONTRAST		
		1.30	5.06	3.76	(184.3)UPPER BOUND	27.0487=STANDARD ERROR		
NNDIETMETCLBENZAM								
	1.00000	0.00	0.00	0.00				
	1.00000	0.00	0.00	0.00			63	1
	1.00000	0.00	0.00	0.00			63	2
	1.00000	0.00	9.64	9.64			3	3
							3	4
NNDIETMETCLBENZAM	1.00000	0.00	2.41	2.41	3.4	74.8250=CONTRAST		
		-0.00	4.82	4.82	(50.4)UPPER BOUND	18.2362=STANDARD ERROR		
NNDIETMETCLBENZAM								
	0.10000	12.50	50.63	63.13				
	0.10000	12.50	57.91	70.41			3	1
							3	2
NNDIETMETCLBENZAM	0.10000	12.50	54.27	66.77	82.7	13.9268=CONTRAST		
		-0.00	5.14	5.14	(143.8)UPPER BOUND	24.6920=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/50.8NCM)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
NNDIETHETCLBENZAM								
	0.01000	6.52	41.87	48.40			3	1
	0.01000	5.88	55.15	61.03			3	2
NNDIETHETCLBENZAM	0.01000	6.20	48.51	54.71	67.8	25.9823=CONTRAST		
		0.45	9.39	8.94	(128.6)UPPER BOUND	24.6920=STANDARD ERROR		
NNDIETHETCLBENZAM								
	0.00100	11.54	76.53	88.07			3	1
	0.00100	4.17	47.31	51.47			3	2
NNDIETHETCLBENZAM	0.00100	7.85	61.92	69.77	86.5	10.9259=CONTRAST		
		5.21	20.66	25.88	(147.5)UPPER BOUND	24.6920=STANDARD ERROR		
NNDIETHETCLBENZAM								
	0.10000	0.00	0.00	0.00			63	1
	0.10000	0.00	0.00	0.00			63	2
NNDIETHETCLBENZAM	0.10000	0.00	0.00	0.00	0.0	73.5639=CONTRAST		
		-0.00	-0.00	-0.00	(73.4)UPPER BOUND	27.0487=STANDARD ERROR		
NNDIETHETCLBENZAM								
	0.01000	4.17	15.76	19.92			64	1
	0.01000	1.96	4.92	6.88			64	2
NNDIETHETCLBENZAM	0.01000	3.06	10.34	13.40	11.9	99.3773=CONTRAST		
		1.56	7.67	9.23	(59.7)UPPER BOUND	27.0487=STANDARD ERROR		
NNDIETHETCLBENZAM								
	0.00100	1.96	13.20	15.17			64	1
	0.00100	6.38	30.63	37.02			64	2
NNDIETHETCLBENZAM	0.00100	4.17	21.92	26.09	23.1	86.6875=CONTRAST		
		3.13	12.32	15.45	(71.0)UPPER BOUND	27.0487=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/SQ.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
4DEAETHOXY BENZAD								
	1.00000	31.91	68.13	100.04			47	1
	1.00000	20.41	64.04	84.44			47	2
4DEAETHOXY BENZAD	1.00000	26.16	66.08	92.24	71.8	36.1879=CONTRAST		
		8.14	2.89	11.03	(106.1)UPPER BOUND	22.0852=STANDARD ERROR		
4DEAETHOXY BENZAD								
	0.10000	32.00	78.15	110.15			47	1
	0.10000	18.00	46.94	64.94			47	2
4DEAETHOXY BENZAD	0.10000	25.00	62.55	87.55	68.2	40.8809=CONTRAST		
		9.90	22.07	31.97	(102.5)UPPER BOUND	22.0852=STANDARD ERROR		
NNDIPHENYLFORMIDE								
	1.00000	6.12	27.62	33.75			49	1
	1.00000	7.69	42.49	50.19			49	2
NNDIPHENYLFORMIDE	1.00000	6.91	35.06	41.97	44.8	51.7206=CONTRAST		
		1.11	10.51	11.62	(93.0)UPPER BOUND	22.6306=STANDARD ERROR		
NNDIPHENYLFORMIDE								
	0.10000	3.85	50.36	54.21			49	1
	0.10000	3.85	24.06	27.90			49	2
NNDIPHENYLFORMIDE	0.10000	3.85	37.21	41.05	43.8	52.6327=CONTRAST		
		-0.00	18.60	18.60	(92.0)UPPER BOUND	22.6306=STANDARD ERROR		
NNDIPENYLFORMIDE								
	0.01000	6.00	16.02	22.02			4	1
	0.01000	1.85	7.07	8.92			5	2
NNDIPENYLFORMIDE	0.01000	3.93	11.55	15.47	22.5	51.9525=CONTRAST		
		2.93	6.33	9.26	(90.1)UPPER BOUND	22.7255=STANDARD ERROR		

REPELLENCY OF COMPOUNDS CONTRASTED WITH CONTROL VALUES (Cont)

COMPOUND NAME	CONCENTRATION ON MOUSE (MG/50.INCH)	MOSQUITOES ENGORGED (PCT)	TIME DISPLACED (PCT)	REPELLENCY INDEX	WEIGHTED PERCENT OF CONTROLS		Day of Test	Test Number
DEAACETALD DEACET								
	1.00000	7.84	38.67	46.51			2	1
	1.00000	22.45	75.47	97.92			2	2
DEAACETALD DEACET	1.00000	15.15	57.07	72.22	75.6	23.0518-CONTRAST		
		10.33	26.02	36.35	(132.4)UPPER BOUND	27.0487=STANDARD ERROR		
DEAACETALD DEACET								
	0.10000	12.24	50.77	63.02			2	1
	0.10000	5.68	47.24	53.12			2	2
DEAACETALD DEACET	0.10000	9.06	49.01	56.07	61.0	37.1987-CONTRAST		
		4.50	2.50	7.00	(117.6)UPPER BOUND	27.0487=STANDARD ERROR		